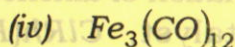
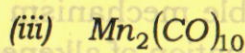
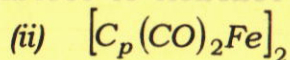
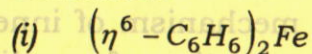


(b) The compound  $W(\eta^5-C_5H_5)((H)(CO)_3)$  reacts with  $C_3H_6$  to give three products A, B and C. Identify and draw the structure of compounds A, B and C. Each compound obeys the 18-electron rule.

(c) For the following species, calculate the number of electrons in the valance shell, give their reasonable structures and comment on their relative stabilities.  $2\frac{1}{2} \times 4 = 10$



(d) Discuss the preparation and structure of ferrocene. Explain the mechanism of acetylation reaction.  $2\frac{1}{2} + 2\frac{1}{2} + 5 = 10$

(e) On the basis of VBT, how will you explain lability and inertness of transition metal complexes? Discuss how the following factors affect the lability of a complex:  $4 + (2 \times 3) = 10$

(i) Geometry of the complex

(ii) Oxidation state of the metal ion

(iii) Ionic radius

(f) What are metal alkyls? Discuss the structural features of methyl lithium and trialkyl aluminium.  $2 + 4 + 4 = 10$

Total number of printed pages-4

3 (Sem-6/CBCS) CHE HC 1

2023

**CHEMISTRY**

(Honours Core)

Paper : CHE-HC-6016

**(Inorganic Chemistry-IV)**

Full Marks : 60

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

1. Answer the following:  $1 \times 7 = 7$

(a) What are fluxional organometallic compounds?

(b) The most suitable route to prepare the *trans*- isomer of  $[PtCl_2(NH_3)(PPh_3)]$  is:

(i)  $[PtCl_4]^{2-}$  with  $PPh_3$  followed by reaction with  $NH_3$

(ii)  $[PtCl_4]^{2-}$  with  $NH_3$  followed by reaction with  $PPh_3$



(iii)  $[P(NH_3)_4]^{2+}$  with  $HCl$  followed by reaction with  $PPh_3$

(iv)  $[P(NH_3)_4]^{2+}$  with  $PPh_3$  followed by reaction with  $HCl$

(c)  $[Ni(CM)_4]^{2-}$  is kinetically \_\_\_\_\_ but thermodynamically \_\_\_\_\_.

(d) 'Low spin complexes are labile but prefer associative mechanism'.

[True or False]

(e) How many metal-metal (M-M) bonds are there in  $Ir_4(CO)_{12}$ ?

(f) Why metal-carbonyl complexes always obey 18 electron rule?

(g) Why interfering radicals do not interfere till group II in the analysis of basic radicals?

2. Explain why/how :  $2 \times 4 = 8$

(a) Square planar complexes are generally labile.

(b) Solubility product plays an important role in qualitative analysis.

(c) Direct nitration of ferrocene is not possible.

(d) Ferrocene undergoes electrophilic substitution  $10^6$  times faster than benzene.

3. Answer **any three** of the following :

$5 \times 3 = 15$

(a) Discuss the dissociative nucleophile substitution reaction in the light of CFT.

(b) Discuss the methods of removal of fluoride and phosphate ions during the qualitative analysis of salt mixtures.

$2\frac{1}{2} + 2\frac{1}{2} = 5$

(c) Explain the mechanism of inner sphere redox reaction of coordination compounds.

(d) Write the plausible mechanism for the catalytic hydrogenation of alkenes using Wilkinson's catalyst,  $ClRh(PPh_3)_3$ . Identify the reaction type of each step.

(e) Discuss the bonding in M-CO fragments. How, IR spectra can be used to distinguish between terminal and bridging CO groups?

$3 + 2 = 5$

4. Answer **any three** of the following :

$10 \times 3 = 30$

(a) Write notes on the following:  $5 \times 2 = 10$

(i) Multicenter bonding in methyl-lithium.

(ii) Stepwise and overall formation constants of a reaction.



(iii) Predict the chemical shift positions for the protons in 1-bromoethane and hence draw a rough sketch of the  $^1\text{H}$  NMR spectrum. 3

(iv) In a  $^1\text{H}$  NMR spectrum, the protons of ethene appear at a more downfield region than expected. Why? 2

(f) (i) Explain the basic principle of NMR spectroscopy. 5

(ii) Explain, why ESR spectrum is recorded in derivative mode? 2

(iii) Predict and draw the hyperfine structure of  $\text{CH}_3$  using ESR spectroscopy. 3

Total number of printed pages-8

3 (Sem-6/CBCS) CHE HC 2

2023

## CHEMISTRY

(Honours Core)

Paper : CHE-HC-6026

(Organic Chemistry-V)

Full Marks : 60

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

1. Answer the following questions : 1×7=7

(a) What do you mean by fingerprint region?

(b) Which of the following is a chromophore?

(i)  $-\text{SO}_3\text{H}$

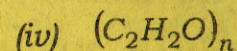
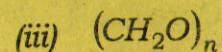
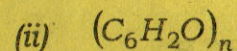
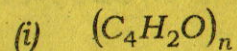
(ii)  $-\text{OH}$

(iii)  $-\text{COOH}$

(iv)  $-\text{NO}_2$



(c) The general formula of carbohydrate is—



(d) Which of the following compounds do not absorb light above  $200m\mu$ ?

(i) Ethanol

(ii) Diethyl ether

(iii) 2-Butanone

(iv) Benzene

(e) At what wavelength range the coloured compounds absorb?

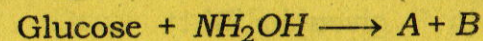
(f) Give *one* example of a thermosetting plastic.

(g) What are the expected products of hydrolysis of Lactose?

2. Give answer of the following :  $2 \times 4 = 8$

(a) What are the different types of electronic transitions that occur in an organic molecule?

(b) Find out the products A and B in the following reaction :



(c) What is a mordant dye? Give *one* example.  $1 + 1 = 2$

(d) Give *one* example of each of the following polymers :  $1 + 1 = 2$

(i) Polyamides

(ii) Polyesters

3. Answer **any three** of the following :

$5 \times 3 = 15$

(a) (i) How can you distinguish between intra and inter-molecular hydrogen bonding with the help of IR spectroscopy? 3

(ii) How can you distinguish the following pair of compounds using IR spectroscopy Propanone and Propanal? 2



(b) Fructose contains a keto group, but still it gives silver mirror test on treatment with Tollen's reagent. Explain by showing the rearrangement reactions involved. What is the name of the rearrangement reaction?  $2+2+1=5$

(c) Match the following in 'A' with those given in 'B' :  $1 \times 5 = 5$

'A'

'B'

- |                      |                      |
|----------------------|----------------------|
| (i) D-Sorbitol       | (a) Anomeric carbon  |
| (ii) L-Ascorbic acid | (b) A disaccharide   |
| (iii) Glycoside      | (c) A sugar lactone  |
| (iv) C-L of glucose  | (d) Sugar alcohol    |
| (v) Maltose          | (e) A reducing sugar |

(d) Write the synthesis of Congo red dye. Show the structural changes involved due to which it changes color from red to blue in acid solution.  $2+3=5$

(e) (i) Write the full form of the following terms : 2

- (i) PAN
- (ii) PTFE
- (iii) PCTFE
- (iv) BSR

(ii) What are polyolefins and polydienes? Give *one* example of each.  $1+2=3$

4. Answer **any three** of the following :  $10 \times 3 = 30$

(a) (i) Draw the Fisher's Projection formula of D-glucose.

(ii) What do you mean by the term anomerization? Show the mechanism of anomerization of D-glucose.

(iii) Draw the chair conformers of both the  $\alpha$ -D(+) and  $\beta$ -D(+) glucopyranose.

(iv) How do you explain the greater stability of  $\beta$ -D(+)-glucopyranose from their conformers?

$1+3+3+3=10$

(b) (i) How will you bring the following conversions?  $3 \times 2 = 6$

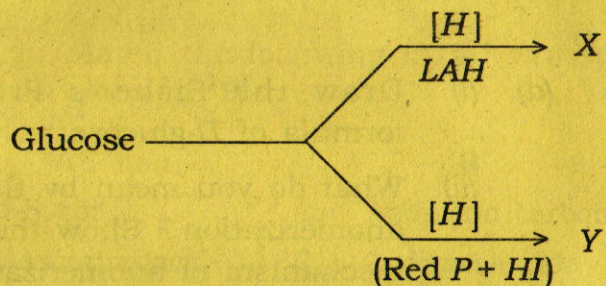
(A) An aldopentose to an aldohexose

(B) D-fructose to D-glucose



- (ii) How many stereoisomers are possible for both aldohexoses and 2-ketohexose? 2

- (iii) Find  $X$  and  $Y$  in the following reactions : 2



- (c) (i) Give the classification of dyes on the basis of their functional group or chemical constitution. 5

- (ii) What are acid and basic dyes? Give *one* example of each dye. Name the fabric to which they can be applied. 5

- (d) (i) What are the two monomers of Dacron? 2

- (ii) Give *two* differences between linear polymers and branched chain polymers. 2

- (iii) Write a note on biodegradable polymers. 2

- (iv) Fill in the blanks :  $1 \times 4 = 4$

- (A) Polymers which have (—COO—) linkages are known as \_\_\_\_\_.

- (B) Polyethene is obtained by the polymerisation of \_\_\_\_\_.

- (C) Polystyrene is obtained by the polymerisation of styrene in presence of \_\_\_\_\_ as initiator.

- (D) Proteins are the examples of \_\_\_\_\_ polymers.

- (e) (i) How many electronic transitions are expected for benzene? 1

- (ii) Use Woodward-Fieser rule to determine the  $\lambda_{max}$  of the following compounds : 2+2=4

